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Article (Accepted Version)

Jakob, Michael, Steckel, Jan Christoph, Jotzo, Frank, Sovacool, Benjamin K, Cornelson, Laura, Chandra, Rohit, Edenhofer, Ottmar, Holden, Chris, Löschel, Andreas, Nance, Ted, Robins, Nick, Suedekum, Jens and Urpelainen, Johannes (2020) The future of coal in a carbon-constrained climate. *Nature Climate Change*, 10. pp. 704-707. ISSN 1758-678X

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The future of coal in a carbon constrained climate

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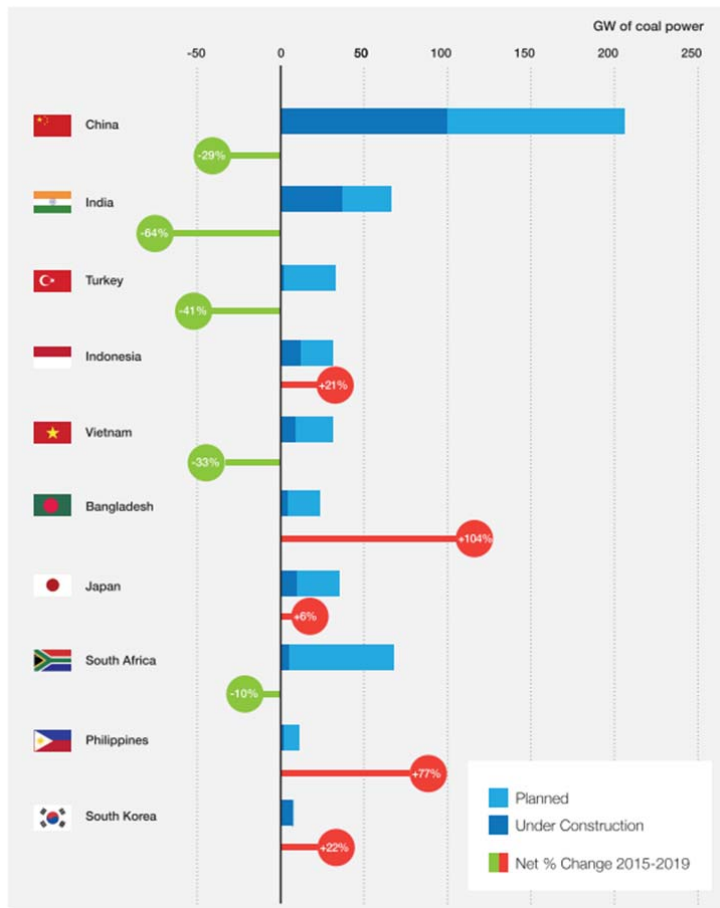
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25 **Phasing out coal requires expanding the notion of a ‘just transition’ and a roadmap which specifies**
 26 **the sequence of coal plant retirement, the appropriate policy instruments as well as ways to**
 27 **include key stakeholders in the process.**

28 Despite decades of knowledge about its contribution to climate change, coal combustion accounts
 29 for 40% of global CO₂ emissions from energy use. The power sector must stop using coal without
 30 carbon capture-and-storage by about 2050, if the Paris Agreement climate goals are to be achieved.¹
 31 This will not come easy. Globally, the coal mining industry alone employs about 8 million people and
 32 creates revenues of more than USD 900 billion a year.² While growth in coal investments is slowing
 33 and COVID-19 induced electricity demand reductions have cut coal fired electricity output in 2020,
 34 coal use is unlikely to decline substantially in the medium term. Reductions in the United States and
 35 Europe are offset by growth in China, India and other Asian countries^{3,4}, thus locking in future
 36 demand. African countries might follow next.⁵

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41 Figure 1: Coal-fired power plants in the pipeline (planned, announced or under construction) as well as changes relative to
 42 2015 (ref ⁶). Percentage changes denote changes in the total pipeline between 2015 and 2019.

43

44 Still, the urgency of climate change action demands the world to reduce coal use without carbon
 45 capture and storage quickly, and cease it over coming decades⁷. Yet, focusing on the environmental
 46 and health related externalities^{8,9} of coal combustion will likely not be sufficient to phase out coal.

47 Rather, it will be crucial that the coal phase out is seen as fair and that the process corresponds to
48 political realities. Policy makers need to understand in more detail who will be affected by a
49 transition away from coal, how these societal groups can be effectively compensated and how
50 powerful vested interests can be counterbalanced.

51 **Expanding the notion of just transition**

52 It is understood that a coal phase out can only succeed if it takes into account social objectives and
53 priorities. The necessity of a 'just transition' is widely acknowledged (Box 1). Such dialogue typically
54 emphasizes employment creation, but often fails to include considerations related to i) regional
55 economic development, ii) effects of higher energy prices for consumers and energy-intensive
56 industries, or iii) how just transitions dynamics may cascade beyond individual countries¹⁰. Hence,
57 what is needed is a just and feasible transition providing decent work and quality jobs as well as
58 regional economic futures, while at the same time limiting adverse impacts on consumers and
59 energy-intensive industries.

60

61 **Box 1: The just transition to date**

The concept of 'just transition' goes back to the 1990s. It was coined by trade unions to support social assistance programs for workers who lost their jobs as a result of environmental policies.¹¹ In the climate policy discussion, its importance has been recognized in the preamble of the Paris Agreement, which calls for "[t]aking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs" (p.2 in ref¹²), and the 'Solidarity and Just Transition Silesia Declaration'¹³ adopted in 2018 at the 24th UN climate conference in Katowice, Poland. To date, there are a multitude of national commissions, policies, or task forces in place, including Canada, China, Czech Republic, Germany, Ghana, Indonesia, New Zealand, South Africa, Spain, the United States and Vietnam. A just transition is also backed by powerful coalitions and groups such as the International Trade Union Confederation (ITUC) and the International Labour Organization (ILO). We agree with calls to expand the notion of just transitions, to also reflect the potential negative effects of energy transitions on households and consumers, industry and regional development^{14,15}.

62

63 *Regional economic futures*

64 While the environmental and health effects of coal are well understood, policy makers in newly
65 industrializing countries often highlight the importance of coal for industrial development in specific
66 regions¹⁶. Planning for alternative regional economic futures to substitute for coal requires a clearer
67 understanding of the upstream and downstream links of coal mining and coal-fired power generation
68 to the broader economy. Such plans could include the provision of transport and communication
69 infrastructure, investment in higher education to attract human capital and new business
70 opportunities, as well as the relocation of government services.

71 *Impacts on consumers and energy-intensive industries*

72 Renewing energy supply systems can increase electricity system cost, for example where depreciated
73 coal plants produce at lower costs than new alternative power generation assets. It is then a
74 question of social equity to shield the poor from electricity price increases. This can be achieved by

75 adjusting electricity tariffs, raising social spending or subsidizing energy efficiency, depending on the
76 given institutional and political context.

77 Foregoing coal could also affect the competitiveness of industries such as steel, aluminum,
78 chemicals, and other important components of industrial strategy. This might raise the risk of ‘carbon
79 leakage’, i.e. the migration of energy-intensive industries to regions with laxer climate measures,
80 thus undermining the benefits for the climate and make coal phase-outs politically more difficult.
81 More fine-grained projections of leakage risks in different sectors under a wide range of scenarios
82 are required to explore which policy instruments can effectively reduce leakage. Options include
83 coordinated implementation of emission reductions among different countries, the free allocation of
84 permits within emissions trading schemes, border carbon adjustments, carbon contracts for
85 difference, and mechanisms of technology transfer.¹⁷

86 *Expanding the feasibility space for phasing out coal*

87 The coal industry typically is a powerful stakeholder with vested interests in delaying coal phase-out.

88 Strategies to overcome the influence of vested interests might include government payments for
89 coal power plants that are being closed. In Germany, for example, the government agreed in early
90 2020 on a set of measures to phase out coal by 2038 with additional costs of € 70 to 90 billion,
91 including € 4.35 billion to operators of (lignite) coal-fired power plants that in turn shut down their
92 plants early, i.e. before 2030. More cost-efficient alternatives that could be assessed include
93 accelerated carbon pricing or industry-internal schemes whereby remaining power stations pay out
94 plants that are retiring ahead of their end of economic life.¹⁸ In addition, the interests of alternative
95 energy producers can be leveraged to help build coalitions that create support for coal phase-out
96 that partially offsets the opposition of those losing out^{19,20}.

97 **A roadmap to phase out coal in practice**

98 A viable coal phase-out strategy will need to avoid that new coal-fired power plants are built. This
99 prevents locking in long-lived assets and is usually politically easier to achieve than closing existing
100 plants early. In many cases expanding power supply through sources other than coal, i.e. renewables
101 or natural gas, is cost effective, even before considering the environmental and health costs of coal
102 use. This will increasingly be the case as the cost of renewable energy technologies continues to fall.
103 Nevertheless, there are factors that tend to favor continued investment in coal assets, including the
104 security of supply in regions with abundant coal resources, the desire to protect jobs in the coal
105 sector and in regional areas of coal production, dependence of public budgets on royalties from coal
106 mining, as well as political influence of owners of coal mines and power producers.

107 Coal phase-outs therefore require roadmaps based on a clear understanding of which plants are to
108 be phased out when, which policies can be applied and how affected stakeholders can be included in
109 the process.

110 *Sequence phase-outs*

111 The age profile of coal power plants differs greatly between countries. Industrialized countries
112 typically built up a large part of their power infrastructure before 1990, whereas India, China and
113 many other industrializing countries ramped up coal use in the last 15 to 30 years¹ (Economic logic
114 suggests that relatively old, and typically less efficient, plants often found in developed countries
115 should be decommissioned first. Other factors to consider are the public health impacts of associated

air pollution and water use in densely populated areas. A realistic sequence of power plant closure will also need to take into account political and institutional constraints.

A nuanced understanding of the associated political barriers as well as feasible no-lose options can help to identify countries and regions where policy action in the near term is more likely than in.

Choosing the right instruments

Coal producers and consumers need to understand the real costs of coal, including local health damages and climate consequences for the climate. Removing any existing coal subsidies would be a step to creating a level playing field for clean energy sources to compete. Some jurisdictions may want to impose an additional carbon cost on coal plants to accelerate coal phase-out. To be socially equitable and politically acceptable, a carbon price could raise funds in support of affected workers, communities and consumers. It may be usefully embedded within a broader reform to the tax system geared to assist low-income households.²¹

In addition, central banks and financial regulators need to include the climate and financial risks associated with coal assets in the prudential management of banks, insurers and institutional investors.²² Transparent disclosure of exposure to financial risks of climate policy could provide an important motivation for investors to reallocate assets away from coal.²³ Financial investors increasingly decline to invest in coal-based assets already, because they are seen as high risk.²⁴

Stakeholder involvement and communication

Efforts to phase out coal will only succeed if stakeholders are involved early on in the decision process to ensure democratic legitimacy. This is particularly important in times in which populist parties increasingly depict climate change mitigation as project undertaken by the political elite against the interests of the broader population, and where well founded concerns about economic prosperity dominate public discourses.

Different forms of public deliberation, such as stakeholder dialogues, just transition commissions, and citizen assemblies, reflect public opinion and could be apt to further agreement between different interests. This raises the question of how participants are selected, in which form and frequency discussions take place, how scientific knowledge is used as an input and how the results of public deliberation are used by policy-makers. Policy makers could adapt their communication strategies on coal phase-out for different audiences that highlight the key benefits that align with individual concerns, , for instance emphasizing the importance of coal phase-out for climate change mitigation for one social group, and the more localized benefits of reduced air pollution for others.

How to phase out coal

To achieve internationally agreed climate targets, the world will need to phase out coal rapidly and immediately. This may be politically even more difficult in the altered political and economic landscape after the coronavirus pandemic. Roadmaps for coal phase out, smart use of a combination of policy instruments and effective integration of powerful stakeholders into the process are key to success.

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